WHAT IS CLAIMED IS:

1. A process for alkylation of a hydrocarbon compound comprising.

a) providing a catalyst including a zeolite Y having a crystal size of no more than 100nm;

b) reacting an alkylatable hydrocarbon with an alkylating agent in the presence of said catalyst under alkylation reaction conditions to provide an alkylate product.

2. The process of claim 1 wherein the alkylation process is olefin/paraffin alkylation.

3. The process of claim 2 wherein the alkylatable hydrocarbon is isobutane and the alkylating agent is a butene.

4. The process of claim 3 wherein the alkylate product comprises a gasoline having a research octane number of at least 99.5.

5. The process of claim 1 wherein the alkylation process is aromatic alkylation.

6. The process of claim 5 wherein the alkylatable hydrocarbon is benzene and the alkylating agent is selected from the group consisting of ethylene, propylene, 1-butene, 2-butene, and isobutene.

7. The process of claim 1 wherein the alkylation process comprises transalkylation the alkylatable hydrocarbon is a bare ring aromatic compound and the alkylating agent is a polyalkylated aromatic compound.

8. The process of claim 7 wherein the bare ring aromatic compound is benzene and the polyalkylated aromatic compound is selected form the group consisting of diethylbenzene and di-isopropyl benzene.

9. The process of claim 1 wherein the step of providing a catalyst comprises:

a) providing a porous inorganic oxide

b) impregnating the porous inorganic oxide with

a liquid solution containing an inorganic micropore forming directing agent which provides hydroxide ions, wherein the amount of liquid solution is no more than about 100% of the pore volume of the inorganic oxide, and the concentration of the micropore forming directing agent in the liquid solution ranges from about 25% to about 60% by weight, and

c) heating the impregnated porous inorganic oxide at an elevated synthesis temperature for a duration of time sufficient to form a zeolite containing product.

10. The process of claim 9 wherein the liquid solution of inorganic micropore forming directing agent is an aqueous solution of sodium hydroxide.

11. The process of claim 1 wherein the zeolite Y has a crystal size of no more than about 50 nm.

12. The process of claim 1 wherein the zeolite Y has a crystal size of no more than about 25 nm.

13. The process of claim 1 wherein the zeolite Y has a sodium content of no more than about 0.2 wt%.

14. The process of claim 1 wherein the zeolite Y has a sodium content of no more than about 0.1 wt%.

15. The process of claim 1 wherein the zeolite Y has a sodium content of no more than about 0.05 wt%.

16. The process of claim 1 wherein the catalyst includes a refractory oxide binder.

17. The process of claim 16 wherein the refractory oxide binder comprises one or more oxides selected from the group consisting of silica, alumina, silica-alumina, titania and zirconia.

18. The process of claim 1 wherein the zeolite Y includes one or more metals selected from the group consisting of Pt, Pd, Ir, Ru, Rh, Os, Fe, Co, Ni, La, Ce, Pr, Ti, Zr, Hf, V, Nb, Ta, Cr, Mo, W, Cu, Ag and Au.

19. The process of claim 1 wherein the zeolite Y includes lanthanum and wherein the lanthanum to zeolite mass ratio is at least about 0.04.

20. The process of claim 1 wherein the zeolite Y has a mesopore to micropore volume ratio of from about 0.2 to about 0.6.

21. The process of claim 1 wherein the catalyst has a BET surface area of at least about 275 $m^2/g$, and wherein the zeolite Y has a rare earth metal component with a mass ratio of rare earth metal to zeolite of at least about 0.04, wherein the zeolite has a mesopore to micropore volume ratio of from about 0.2 to about 6.0, and a unit cell size of from about 24.6 Å to about 24.9 Å.

22. The process of claim 1 wherein the alkylation reaction conditions include a temperature of from about -40°C to about 250°C, a pressure of from about 1 bar to 100 bar, and a WHSV of from about 0.1 to about 500 $hr^{-1}$.